



URG-2456/2344

PATENT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

#6  
9-17-01  
JWmo.

In re application of:

Donald K. Harper, Jr.

Serial No.: 09/661,547

Group Art Unit: 2833

Filed: September 14, 2000

Examiner: A. McCamey

For: HIGH DENSITY CONNECTOR

DECLARATION UNDER 37 C.F.R. § 1.131

Assistant Commissioner  
for Patents  
Washington, D.C. 20231

Dear Sir:

RECEIVED  
SEP 13 2001  
TECHNOLOGY CENTER 2800

I, Donald K. Harper, Jr., based on personal knowledge, hereby declare as follows:

1. I am a staff product engineer at FCI USA Incorporated located at 825 Old Trail Road, Etters, Pennsylvania.
2. I am the sole inventor of the subject matter disclosed in, and claimed in claims 1 through 25 of U.S. Patent Application number 09/661,547.
3. Prior to April 27, 1999, I had completed and reduced to practice the invention disclosed and claimed in U.S. Patent Application number 09/661,547, in the United States of America, a NAFTA and WTO country, as evidenced by the following:
  - a. Prior to April 27, 1999, I conceived of, and prepared a drawing with a textual summary of a device in accordance with that disclosed and claimed in U.S. Patent Application number 09/661,547. A photocopy of the drawing and

textual summary, from which dates have been redacted, is attached hereto as Exhibit A.

- b. Prior to April 27, 1999, I instructed L. Robin Johnson to prepare engineering drawings for the purpose of manufacturing a device in accordance with that disclosed and claimed in U.S. Patent Application number 09/661,547. A photocopy of the engineering drawings prepared by L. Robin Johnson, from which dates and engineering tolerances have been redacted, is attached hereto as Exhibit B.
- c. Prior to April 27, 1999, I requested the preparation of various components from which to assemble devices in accordance with the invention disclosed and claimed in U.S. Patent Application number 09/661,547, as evidenced by a photocopy of a laboratory request EL-98-04-037, from which dates have been redacted, and which is attached hereto as Exhibit C.
- d. Prior to April 27, 1999, I assembled several devices in accordance with that disclosed and claimed in U.S. Patent Application number 09/661,547. A copy of photographs of one of these devices is attached hereto as Exhibit D.
- e. Prior to April 27, 1999, I requested and supervised electrical and environmental testing of the assembled devices in the FCI Qualification Laboratory located at FCI USA Inc., 825 Old Trail Road, Etters, Pennsylvania as evidenced by the copy of laboratory request EL-98-06-031, from which dates have been redacted, and which is attached hereto as Exhibit E. These tests showed the devices to work as intended.
- f. The dates redacted from Exhibits A, B, C, and E are prior to April 27, 1999.

4. All statements made herein of my personal knowledge are true, and all statements made on information and belief are believed to be true. All copies attached hereto are true and accurate copies of the originals.
5. I make the above statements with the knowledge that under 18 U.S.C. § 1001, willful false statements and the like are punishable by fine or imprisonment, or both, and may jeopardize the validity of U.S. Patent Application Number 09/661,547 or any patent issuing therefrom.

Respectfully submitted,

D. Harper  
Donald K. Harper, Jr.

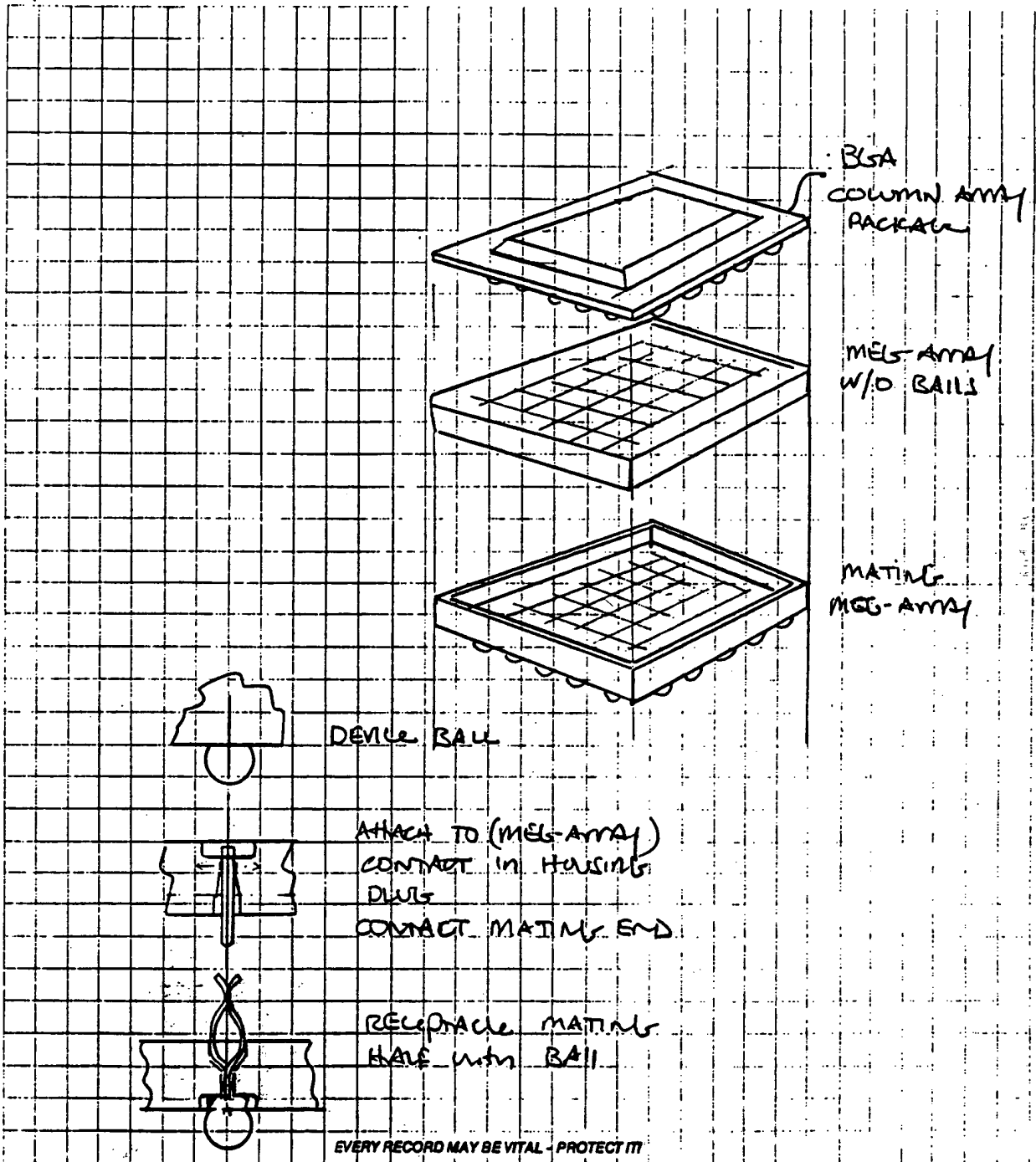
Executed: September 2, 2001

**Exhibit A to  
Declaration of Donald K. Harper, Jr.**

BERG ELECTRONICS DIVISION

BERG 3 398

PROJECT TITLE BALL GRID ARRAY OR SOLDER COLUMN  
PROJECT NO. \_\_\_\_\_  
SUBJECT TO MEG-ARRAY DATE \_\_\_\_\_



SIGNED: D. Hogn

WITNESSED and UNDERSTOOD *Senior R. Johnson*

DATE:

DATE:

## Summary of Invention

### **BGA ball attach to MEG-Array™ connector**

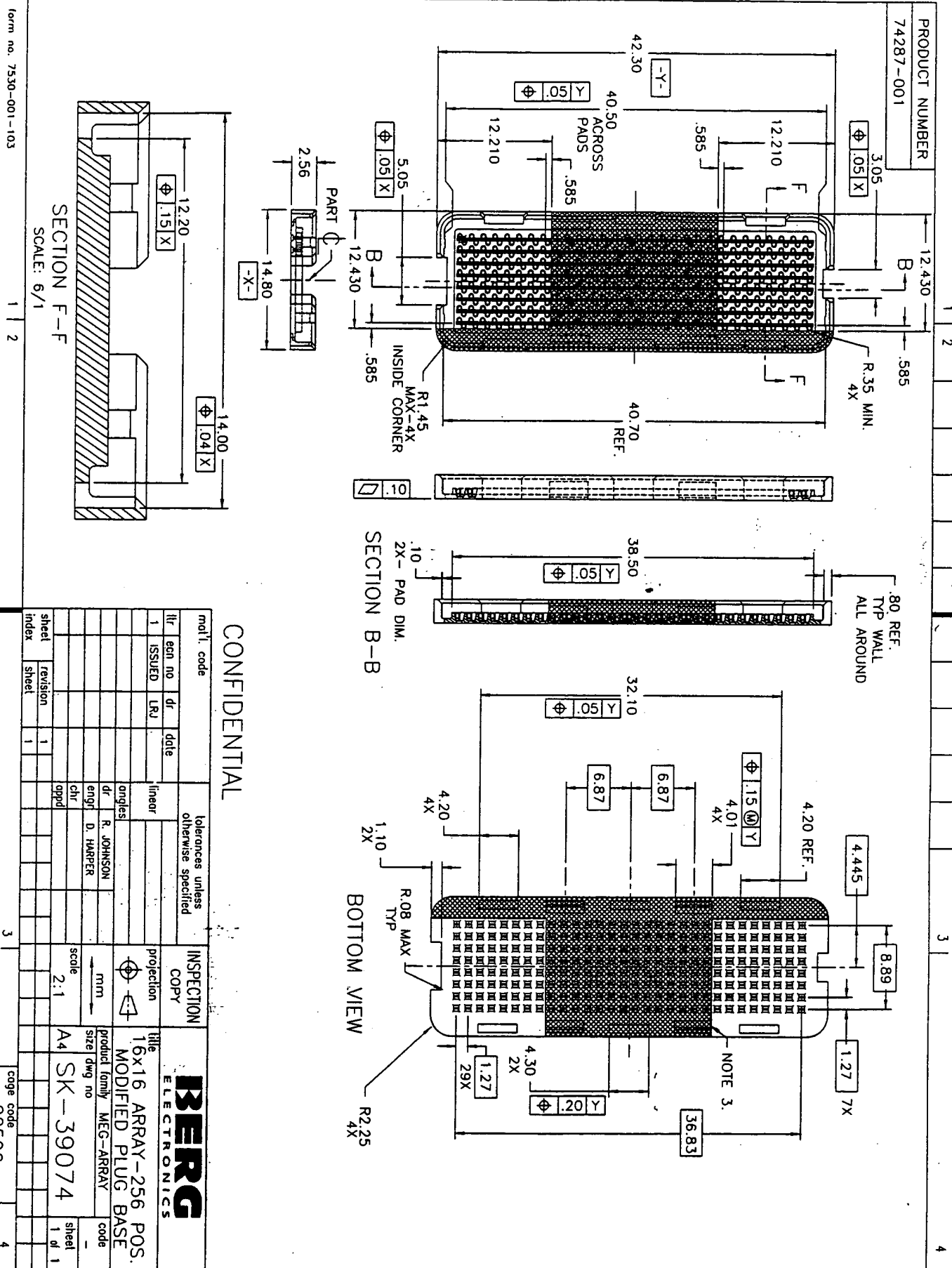
This design attaches a contact directly to the solder ball of a Ball Grid Array to provide a means for socketing the Ball Grid Array component. This contact array can then be connected to a mating array for providing an electrical connection between the two halves.

This provides the ability to socket a BGA component and then direct attach the component by using the same Printed Circuit board connection design for the BGA. An example is for the development of ASIC components.

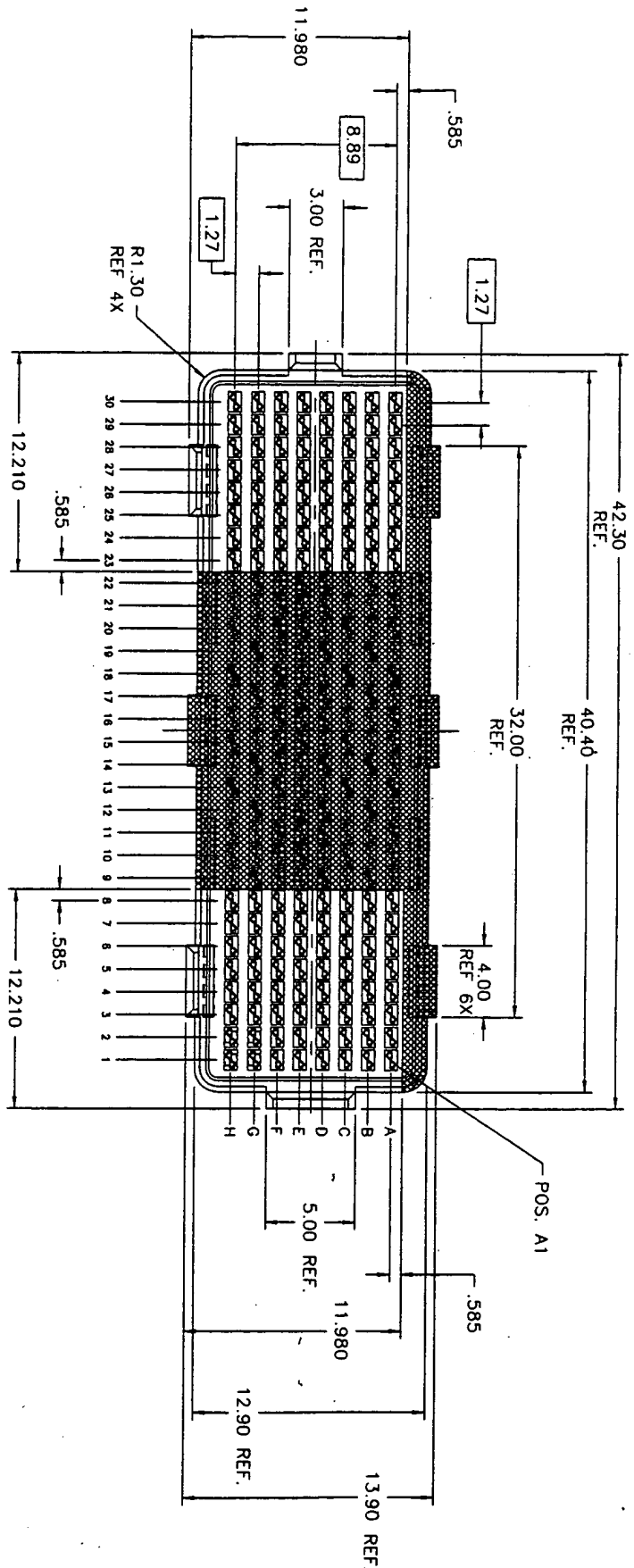
This also provides a more reliable connection to a PCB by;

providing a compliant connection between to materials with different Coefficients of Thermal Expansion (CTE). It compensates for differential expansion and contraction and minimizes the strains that occur at the solder joint interface.

**Exhibit B to  
Declaration of Donald K. Harper, Jr.**







MAKE FROM  
RECPT. BASE  
74214-002

APPLIES AT  
EACH POSITION.

## SOLDER BALLS

RECEIPT. CONTACT

CONFIDENTIAL

REF: USED FOR 3mm MATED HT.

**BERG**  
ELECTRONICS16x16 ARRAY - 256 POS.  
MODIFIED RECEPT. ASS'Y.

A4 SK-39076

sheet  
1 of 1

coge code	22526
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**Exhibit C to  
Declaration of Donald K. Harper, Jr.**

# U. S. PRODUCT TEST LABORATORY REQUEST

Valley Green

Date \_\_\_\_\_ Assigned To: B. Kidron

Requestor: Don Harper Phone 7193

Part Name MECHANICAL Dept # MEL Location VLS

Manufacturing Traceability \_\_\_\_\_ Part Number \_\_\_\_\_

Customer/Vendor \_\_\_\_\_ Lab Engineer \_\_\_\_\_ Job Number \_\_\_\_\_

Check One: ☐ QUALIFICATION ☒ DEVELOPMENT

Requested Output: ☐ Data & Observations Only ☐ Data Reduction & Observations

☐ MANUFACTURING INSPECTION ☐ FAILURE ANALYSIS

Work to be performed: (Include applicable specification, testing procedures or parameters) ☐ Laboratory Report (including Pass/Fail Comparison to Specification)

MODIF 1 CBGA Per sketch 2 Pc

NOTE: DO NOT DAMAGE SOLDER BALLS  
MECHANICAL OR THERMAL

Requested Completion Date: \_\_\_\_\_

Acknowledge Date: \_\_\_\_\_

Request Number: EL 98-04-037

Parts OK By Don Harper

☐ The product was examined prior to testing and found to be suitable for the requested testing.

Completed By/Date: Don Harper

Approval/Date/Title: IC 45.10.111

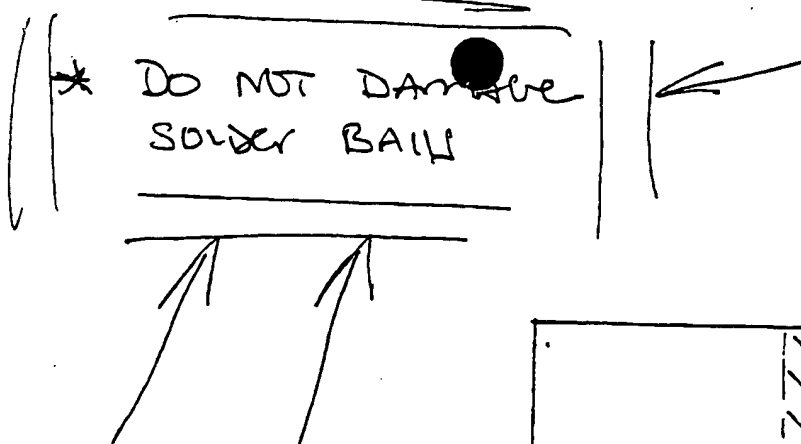
Completed By/Date: \_\_\_\_\_

Completed By/Date: \_\_\_\_\_

Lab request - Rev. 8/97

Copies to: \_\_\_\_\_

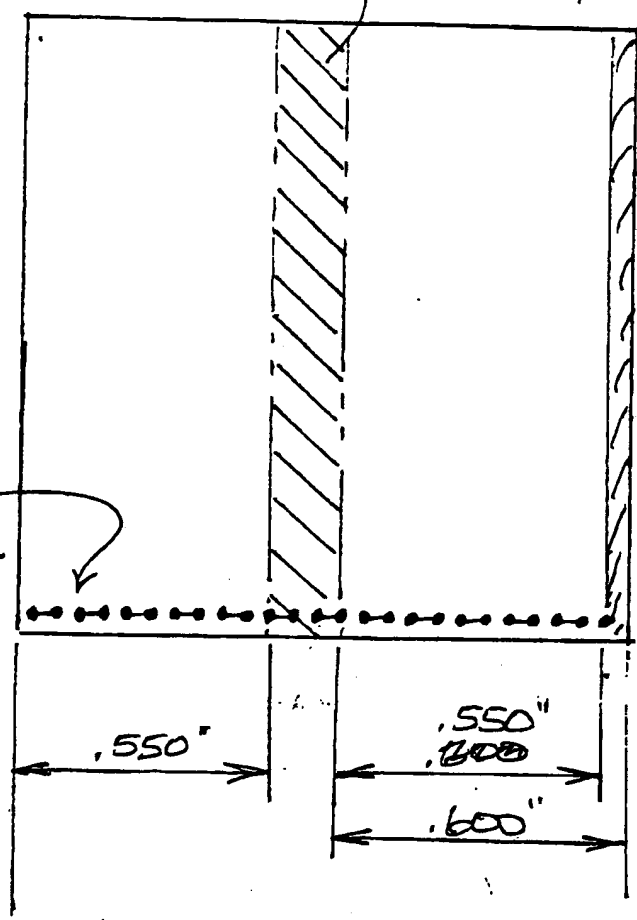
FOR BERG USE ONLY



GRIND  
(SPLIT INTO  
TWO CHIPS)  
\*

REMOVE  
EDGE \*

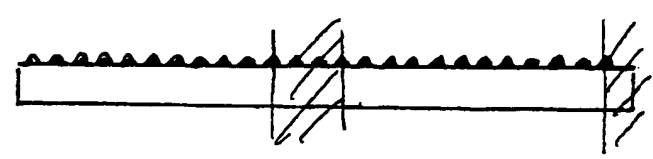
BAIRS AND  
REACTING-SHOWING  
CHIP POSITION



EL-98-04-037

MODIFY 2PC

1.282  
50  
1.232

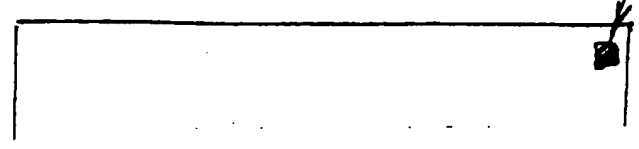


1.280  
1.150  
1.30

D. H.   
579  
550  
29

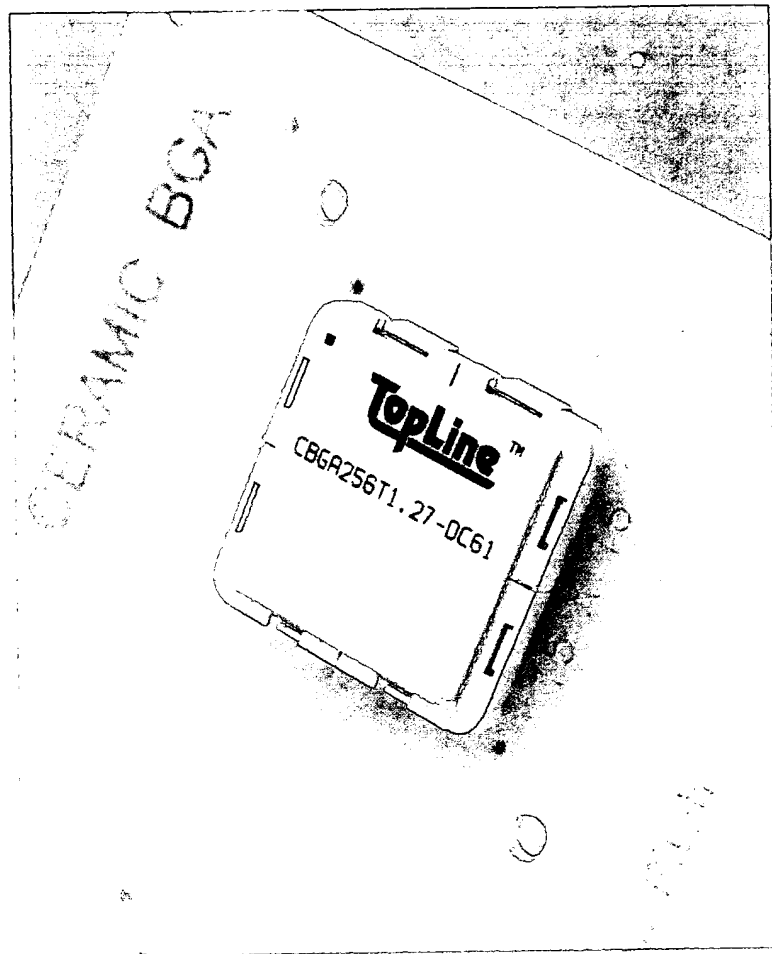
600  
550  
50

PIN #1

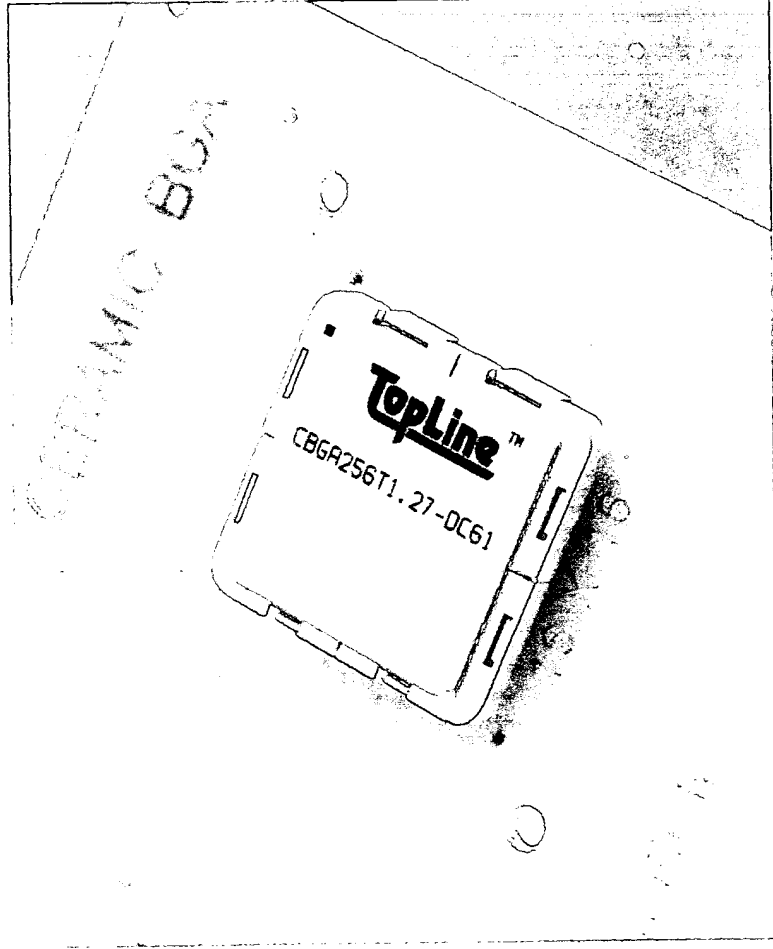


**Exhibit D to  
Declaration of Donald K. Harper, Jr.**

# Ceramic BGA



# Ceramic BGA



**Exhibit E to  
Declaration of Donald K. Harper, Jr.**





# U. S. PRODUCT TEST LABORATORY REQUEST

Valley Green

Requested Completion Date:

Acknowledge Date: EL-98-06-031

Request Number: EL-98-06-031

Date: Assigned To:

Requestor: DON HARPER

Part Name: FLEX ARRAY

Phone: 7193

Dept. #: MES

Location: VC

Part Number:

Manufacturing Traceability:

Customer/Vendor:

Job Number:

Lab Engineer: J. Harper

Check One: ☐ QUALIFICATION ☒ DEVELOPMENT ☐ MANUFACTURING INSPECTION ☐ FAILURE ANALYSIS  
Requested Output: ☒ Data & Observations Only ☐ Data Reduction & Observations ☐ Laboratory Report (Including Pass/Fail Comparison to Specification)

Work to be performed: (Include applicable specification, testing procedures or parameters)

THERMAL CYCLING

1000 cycles -25 to 100°C

1) TWO FLEX ASSEMBLIES

DIE PENETRANT CRACK ANALYSIS AT 1000 cycles

TWO CERAMIC - removed @ 300 cycles due to failure of flex

CHART RECORDING IN FILE # EL-98-06-036

Harper

\* TO BE ADDED INTO

MATTH EMMENHEIERS TEST.

\* See me for samples  
WHEN READY TO set up.

to be completed by Lab:

Completed By/Date: J. A. Harper Completed By/Date: Harper Completed By/Date: Harper

Approval/Date/Title: Paul B. Dill Copies to: Harper

Lab request - Rev. 6/97

FOR BER USE ONLY

Reference BUS-03-702

☐ The product was examined prior to testing and found to be suitable for the requested testing.